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AUTHORITY

OACSFOR ltr, 13 Sep 1973

DEPARTMENT OF THE ARMY
ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96384

AVIB-GCD

30 APR 1969

SUBJECT: Final Letter Report - Evaluation of the Tunnel Explorer Locator and Communicator System (TELACS) (ACG-7/69I)

Commanding General
United States Army, Vietnam
APO 96375

1. REFERENCES

a. Message, AVHGC-DST, USARV, 2 Dec 68, subject: Tunnel Explorer Locator and Communicator System, USALWL Task No. 02-8-68.

b. Letter, CRDLWL-9C, USALWL, 17 Oct 68, subject: Shipment of USALWL Developed Equipment, Tunnel Explorer Locator and Communicator, LWL Task No. 02-P-68.

2. PURPOSE

To determine the suitability of the Tunnel Explorer Locator and Communicator System (TELACS) for use in the Republic of Vietnam (RVN) and, if appropriate, determine a basis of issue.

3. OBJECTIVES

a. Objective 1. Determine if a USARV requirement exists for TELACS.

b. Objective 2. Determine the suitability of TELACS for use in RVN.

c. Objective 3. Determine if TELACS should be made a component of the Tunnel Exploration Kit.

4. BACKGROUND

The extensive construction and use of tunnels by the enemy in RVN created a need to explore, neutralize, and, in some cases, destroy tunnel complexes. Many of these tunnel complexes are multi-level networks with concealed trap doors, dead ends, false walls, and other devices to inhibit

exploration and neutralization. The development by US forces of tunnel rat teams, specially trained and motivated to operate in tunnels, created a need for communication between these teams and the men on the surface. A tunnel rat team usually consists of two men. In coordinating the work of the team, the surface element needs to know the location of the team, to know what they are finding, and to be able to send assistance if necessary. In addition, it is desirable to accurately map the tunnel. The most common communication system currently used is the sound-powered telephone. The system has several serious disadvantages. The necessity of dragging the telephone wire through the tunnel complex limits the mobility of the team. The estimation of distance and determination of direction involve errors which make mapping unreliable. Determination of this data is time-consuming and delays the team in its primary search mission. To overcome these disadvantages, the US Army Limited War Laboratory (USALWL) offered the TELACS for evaluation. Three TELACS units were made available in RVN in December 1968.

5. DESCRIPTION

The TELACS is a battery-operated, portable, two-way radio system that uses electromagnetic induction principle. The system consists of two identical units. Each unit consists of a loop antenna and an audio transceiver with the following characteristics (extracted from ref 1b):

Size	2 x 3 x 7 inches
Weight	4 pounds
Range	120 feet
Location accuracy	Within 6 inches at 6 feet
Power	Internal battery of 5 mercury cells
Battery life	30 hours continuous operation

The TELACS provides voice communication between men in the tunnel and on the surface. A tonal signal from the tunnel unit enables the man on the surface to track the man in the tunnel.

6. DISCUSSION

a. General

The three TELACS units were evaluated December 1968 to March 1969. The 1st and 25th Infantry Divisions each received one unit for combat evaluation. The third system was used by the USARV Engineer Mapping and Intelligence Division for controlled testing. The TELACS were used on approximately 12 tunnel explorations. A questionnaire was prepared by ACTIV for use by the

1st and 25th Infantry Divisions. The USARV Engineers submitted an interim and final report upon completion of their controlled test (see Inclosures 1 and 2).

b. Objective 1. Determine if a USARV Requirement Exists for TELACS

(1) Need for Communication

The evaluation indicated that communication with tunnel rat teams is essential. The surface party must know what the tunnel rat team is doing and be able to assist it if necessary. During the evaluation, there were instances of enemy troops hiding within the tunnel complex while it was being explored. In one case, a tunnel rat was killed in a tunnel by Viet Cong (see Inclosure 1, paragraph 4a).

(2) Need for Tracking the Tunnel Rat

The evaluation showed that it is essential to know exactly where the tunnel rat is located beneath the surface. Mapping difficulties were confirmed. In one case, the tunnel rat team came to the surface outside the perimeter set up by the security forces.

(3) Adequacy of Equipment Presently Used

At present, the tunnel rat team and surface party rely on sound-powered telephone for communication, and a compass and tape or knotted rope for mapping. The telephone provides reliable communication, however, the wire inhibits team mobility. The compass and tape add to the complexity of the team mission. The procedure is time-consuming, requires special training, and produces marginal results.

c. Objective 2. Determine the Suitability of TELACS for Use in RVN

(1) Communication Capability

The communication capability of TELACS was not adequate. This was due primarily to short battery life. Although batteries were rated at 30 hours, they became weak after 4 to 6 hours of continuous use. When the batteries became weak, transmissions became garbled and unreadable. The mode (transmit or receive) must be changed manually by a switch on the transceiver. The tunnel rat must put down his flashlight or weapon to free one hand to operate this switch. This is not a desirable procedure.

(2) Accuracy in Detection and Tracking

The detection and tracking capability of the TELACS was

acceptable, providing the tunnels and tunnel openings were of sufficient size to allow its use. Tunnel overburdens ranged in depth up to 12 feet. Because of the size of the loop antenna, the tunnel rat was frequently unable to take the TELACS into many of the tunnel complexes. An intermittent tonal signal was emitted by the TELACS for tracking purposes. Many of the participating operators felt that a continuous tonal signal would enhance the detection and tracking capability of the system (see Inclosure 1, paragraph 4b).

(3) Ease of Use and Handling

The unit used by the tracker presented no problem in ease of use and handling characteristics. The unit used by the tunnel rat presented two basic problems. It was difficult to turn the mode selection switch in the close confines of the tunnel. The size of the loop antenna restricted movement and frequently prevented complete search of a tunnel complex when small trap doors were encountered.

(4) Reliability and Maintainability

It was determined that the TELACS was a rugged piece of equipment which would withstand normal use. It was easily maintained. The major problem was short battery life and the rapid decrease in reliability as battery power ebbed.

d. Objective 3. Determine if TELACS Should Be Made a Component of the Tunnel Exploration Kit

The Tunnel Exploration Kit used by field units consisted of a telephone, compass, knotted rope or tape, light, and weapon. The TELACS could replace the telephone, compass, and rope or tape if the difficulties and deficiencies described can be eliminated.

7. FINDINGS

a. The TELACS voice communication was unreliable because of short battery life.

b. The transceiver was difficult to operate because of the requirement to manually turn the selector switch to the desired mode.

c. The tracking capability was acceptable when the tunnels, tunnel openings, and interior trap doors were large enough to permit passage of the device. Tunnel overburdens ranged in depth up to 12 feet.

d. The size of the antenna made the TELACS too bulky.

8. CONCLUSIONS

a. The concept of the TELACS is valid.

b. In its present configuration and with its present unreliability the TELACS is not suitable for use in RVN.

9. RECOMMENDATIONS

It is recommended that:

a. The three TELACS be returned to USALWL.

b. USALWL redesign the TELACS to incorporate the following improvements:

(1) Reduce the size of the antenna to a maximum of 8 inches. The diameter of the antenna can be larger if the antenna is a flexible configuration.

(2) Improve the performance of the transceiver with the capability of continuous transmit and receive, without the necessity to manually operate a selector switch. Possibly redesign the microphone and receiver system similar to the one shown in Inclosure 1.

(3) Provide a continuous tone for tracking instead of the intermittent sound now used.

(4) Provide the system with a longer, more reliable battery life.

EJNER J. FULSANG, JR.
Colonel, FA
Acting Commander

3 Incls
1. Interim Comments from USARV Engineer M&I Division
2. Final Comments on TELACS from USARV Engineer M&I Division
3. Distribution List

DISPOSITION FORM

(AR 340-15)

REFERENCE OR OFFICE SYMBOL	SUBJECT
AVHEA-VI	Interim Comments on Tunnel Explorer Locator and Communicator (TELAC)

TO ACTIV FROM Engineer DATE 10 January 1969 CMT 1

LTC JC MULLEN/mws/4109/4173

1. After having used the TELAC device for approximately one month, it is felt that some interim comments on its application are appropriate.

2. The unit has been used about 6 or 8 times in the field, under tactical conditions. Most of the tunnels were in a clay-sand type soil, and were fairly shallow in depth about 3-6 feet).

3. Tunnel rats have been tracked successfully each time the unit was used. The "tone transmit" mode emitted clear sharp signals and only little difficulty was experienced during tracking operations in locating the tunnel rat rapidly.

4. Rather lengthy discussions were held with Mr Olon, EML, during his recent visit. The comments in this DF are, in places, results of these discussions. Mr Olon was not asked to develop a new unit, but was asked about feasibility of some ideas which will be presented below in this DF.

a. The voice communications leave something to be desired. This is the result of several problem areas found in the TELAC device. The lack of continuous voice transmission and receiving without the use of the rotary switch is considered a necessity. The tunnel rat goes in the hole carrying a pistol and flashlight (one in each hand). To operate the TELAC unit, he must put down one or the other to turn the rotary switch on the transceiver. Tunnel rats are not prone to putting down either their light source or weapon when in a tunnel. A means should be developed so that the tunnel rat can talk and receive without manually operating switches. Inclosed is a recommended method of arranging a microphone and earphone system which would leave both hands free. Envisioned is a hat similar to that worn by deck crews of a Navy aircraft carrier. The earphones and microphones could be sewn in and connected by sturdy wires to the main transceiver box. According to Mr Olon, this arrangement is feasible and gives the developer a wider latitude with which to work toward continuous tone/receive capability, because the microphone/speaker in the system now precludes the continuous transmission/receiver application. This has come to light several times in the past month. Once while tracking during a tactical operation, the tunnel rat's batteries started to run down and he could not be told to stop and return to the original entrance, nor could he be tracked further. He came up about ½ hour later some 200 meters outside the perimeter set up by Armored Cavalry and Infantry units. Obviously this presents an untenable situation. The most recent possible application of continuous talk/receive capability was a case where two tunnel rats were on a search following the blood trail of a wounded VC. No TELAC unit was in use at the time. One of the tunnel rats rounded a turn in the tunnel and was shot by a VC. The other had to return all the way to the entrance to tell what happened. Had a unit been in use with continuous talk/receive capability much faster reaction would have been possible. It took 2½ hours to get the dead man out of the tunnel. Had they known the situation and where he was exactly, a hole could have been dug over the spot and the tunnel entered there. I estimate about 15-20 minutes would have been required to get him out. Had the man been wounded, instead of killed, help would have been given far faster. Obviously, this was not the fault of a TELAC device, but points up a definite appli-

Inclosure 1

cation of the device. The Waterways Experimental Station device, although unsuccessful in its tracking capability, had outstanding voice capability. Conversation could take place constantly between the tracker and the tunnel rat.

b. The continuous "beep-beep" of the TELAC device could be replaced by a "tone at null". There are times when tracking through brush that the null cannot be located immediately due to difficulty of the tracker getting into position. By moving his loop, the tracker could miss the null between "beeps" thereby requiring him to reestablish position. With a tone at the null, position is readily apparent. The tracker could probably be trained faster, because all he would have to listen for was a noise, as opposed to a change in noise.

c. One problem which recently arose is that of the size of the loop. Tunnels built for use by VC/NVA are very small. Even a tunnel rat, chosen for his small stature, is larger than the average Vietnamese. When the TELAC unit is added it naturally gives him more bulk. This was brought to light recently when a tunnel rat had to climb between levels of a tunnel. To negotiate the small hole, he had to take off the loop and transceiver go through the hole, and then have the TELAC device handed to him by his partner and, with difficulty, put it on again. With a smaller loop, he might successfully transit holes of this nature.

d. Some better way to affix and carry the tranceiver unit should be developed. Again, it must be remembered that the tunnels are extremely cramped and anything which flaps around is definitely a detriment. Incl 2 is a suggested method.

5. In the above comments, little has been said of the tracker. His problems are quite small compared with those of the tunnel rat. If a system were developed where the tracker had to have a press-to-talk microphone and earphones, so be it. Mr Olon suggested that an interchangeable device, which could be used above or below ground, is a better situation. This is true, logistically and in practice. The only point being, if some technical problem arose in any future changes or development, most of the attention should be directed at the tunnel rat's equipment, because he certainly is at a greater disadvantage than the tracker.

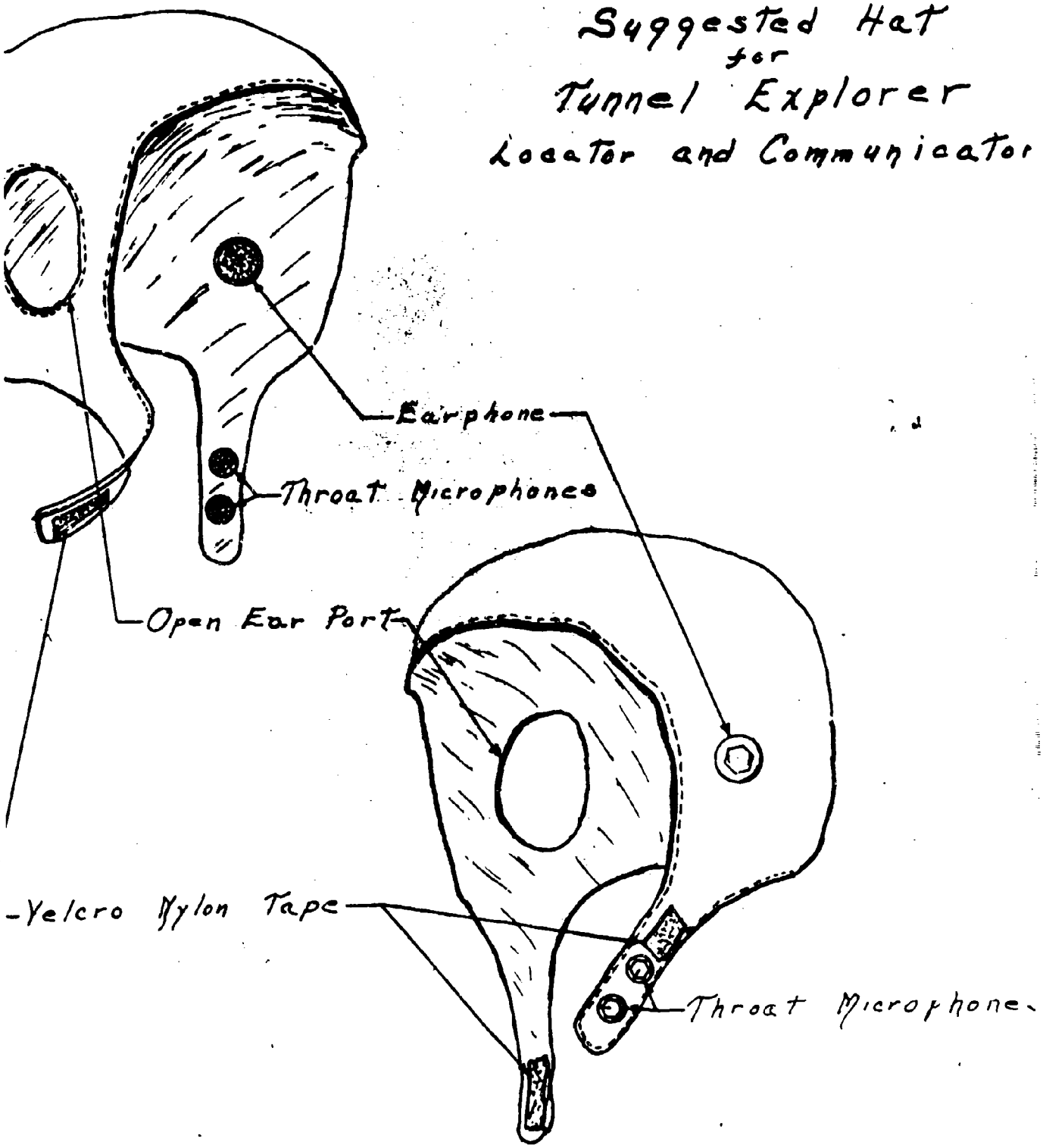
6. Further comments will be made as testing continues.

FOR THE ENGINEER:

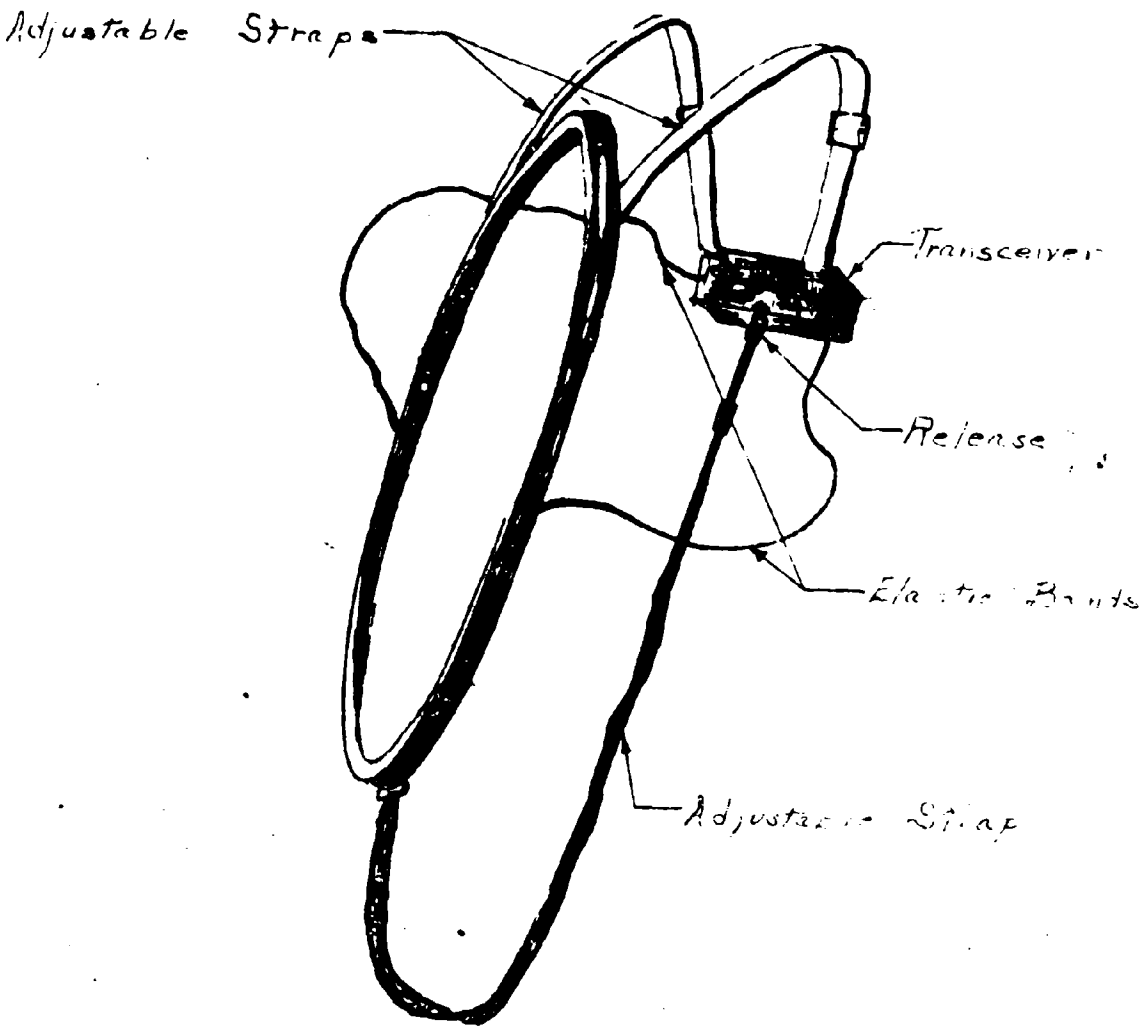
2 Incl
as

J. W. [illegible]
COL, CE
Ch, M&I Div

Suggested Hat for Tunnel Explorer Locator and Communicator



Encl 1


Adjustable Straps
Transceiver
Release
Elastic Bands
Adjustable Strap

And 2

DISPOSITION FORM

(AR 340-15)

REFERENCE OR OFFICE SYMBOL	SUBJECT
AVHEN-MI	Final Comments on Tunnel Explorer Locator and Communicator (TELAC)

TO ACTIV FROM Ch, M&I Div DATE 12 Mar 69 CMT 1

1. Reference: DF, 10 January 1969, AVHEN-MI, Subject: Interim Comments on Tunnel Explorer Locator and Communicator (TELAC).

2. Testing of the TELAC subsequent to the reference cited above has revealed nothing worthy of comment beyond that previously submitted.

3. I want to emphasize that the critical shortcoming of the TELAC remains communications. It is essential to maintain continuous voice contact with the tunnel rat without his having to push a button or turn a switch. In the tight space of a tunnel, the tunnel rat should not be required to perform any manipulation of the instruments he carries because it not only impedes his progress but also endangers his life.

FOR THE ENGINEER:

J. W. MABERRY
COL, CE
Ch, M&I Div

Inclosure 2

DA FORM 1 FEB 62 2496 REPLACES DD FORM 96, EXISTING SUPPLIES OF WHICH WILL BE ISSUED AND USED UNTIL 1 FEB 63 UNLESS SOONER EXHAUSTED.

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13. ABSTRACT

The Tunnel Explorer Locator and Communicator System (TELACS) is a battery-operated, portable, two-way radio system that uses an electromagnetic induction principle. The TELACS provides voice communication between men in the tunnel and on the surface. A tonal signal from the tunnel unit enables the man on the surface to track the tunnel rat. The purpose of the ACTIV Evaluation was to determine the suitability of the TELACS for use in RVN and, if appropriate, determine a basis of issue. It was determined that the concept of the TELACS is valid. However, in its present configuration and with its present unreliability the TELACS is not suitable for use in RVN.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
TUNNELS						
EXPLORATION						
COMMUNICATION						
MAPPING						